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FAO Plant Protection Bulletin

Vol. II, No. 11 A Publication of the August 1954

World Reporting Service on Plant Diseases and Pests

Diseases of Economic Crops in the Sudan
II. Fibers, Oil Seeds, Coffee and Tobacco

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As a continuation of a previous paper [1], the present notes discuss the more important diseases affecting fibers, oil seeds, coffee and tobacco in the Sudan.

Cotton is by far the most important cash crop of the Sudan, lint and seed representing some 75 percent by value of total exports. Annual cultivation exceeds 600,000 acres, of which two-thirds are long staple Sakel type Egyptian cotton (*Gossypium barbadense*) grown under irrigation in the northern Sudan, including some 250,000 acres in the Gezira, and the remainder short staple American cotton (*G. hirsutum*) grown mostly under rain in the Nuba Mountains in central Sudan and, to a lesser extent, in the southern Sudan. Strict quarantine regulations control the importation of seed or other plant material of cotton and other Malvaceae in order to prevent the introduction of diseases and pests not already present.

Egyptian Cotton (*Gossypium barbadense*)

Unless effectively controlled two major diseases, blackarm and leaf curl, can cause almost complete crop failure in Gezira cotton. Blackarm (*Xanthomonas malvacearum*), also known as angular leaf spot or bacterial boll rot (gummosis), is a rain-spread bacterial disease which occurs in most countries where cotton is grown. It can be extremely destructive in the flat, intensively cultivated Gezira plain where the humid warmth and heavy wind-driven rainstorms of the early season provide almost ideal conditions for its rapid development and spread. The elaborate control measures practiced in the Sudan include seed disinfection with mercurial dressings, crop sanitation, wide crop rotations, delay of sowing date to minimize exposure of the crop to rainstorms, and the breeding of resistant cottons. End of season destruction of crop trash is exceedingly thorough, all plants being uprooted and burnt together with the cotton débris swept up from the fields. Blackarm resistant cottons are now grown over considerable areas but have not yet found general acceptance in the Gezira where lint characteristics are vitally important selling factors.

Leaf curl disease (cotton leaf curl virus) is known to attack only Malvaceae, including certain species of *Gossypium*, *Hibiscus*, *Althaea*, *Sida*, *Malvaviscus*, *Malva* and *Lavatera*, and to occur only in the Sudan and West Africa. It induces abnormal growth and sterility of the plant and early attacks can cause heavy crop losses. The virus is spread by the cotton whitefly *Bemisia gossypiperda* (= *B. tabaci*) and is not transmitted by seed, soil or dead crop residues. Seasonal carry-over occurs in living cotton roots remaining in the fields; these sprouts with the following rains provide sources of infection for the new crop. Some carry-over also occurs in infected alternative hosts, chiefly okra (*Hibiscus esculentus*), a widely cultivated

[1] Tarr, S.A.J. Diseases of economic crops in the Sudan I. Cereals. *FAO Plant Prot. Bull.* 2: 75–77. 1954.

vegetable. Control measures include end of season uprooting of all cotton plants to prevent subsequent sprouting, legislation prohibiting cultivation of leaf curl susceptible plants between cotton crops, and cultivation of resistant cottons. The variety X-1730A, selected from the susceptible Sakel variety, usually shows high resistance and is grown in the southern Gezira and elsewhere.

Destructive outbreaks of blackarm and leaf curl can occur if control measures are in any way relaxed. Thus in the 1953-54 season a severe leaf curl attack caused some 20 percent loss of crop over 100,000 acres of cotton in the northern Gezira and was attributed largely to illegal cultivation of okra between cotton seasons.

Minor diseases include sooty mould on the aerial parts of plants, caused mainly by *Cladosporium* spp. and slightly by *Alternaria* spp. and unidentified dematoid fungi. These fungi probably live saprophytically on honeydew resulting from heavy whitefly or aphid infestation. Extensive leaf smothering and shedding occur during severe attacks and control would lie in destruction of the insects primarily responsible. In black boll rot, various fungi, predominantly *Aspergillus niger*, rot the immature lint following damage by bollworms or other pests. *Alternaria gossypina* occasionally causes slight leaf spotting. Damping-off, often associated with *Pythium* spp., sometimes destroys cotton seedlings growing under unfavorable conditions, e.g. in waterlogged soil, but is rarely serious and is probably minimized by the mercurial dressing with which all Gezira sowing seed is treated.

No serious specific fungal wilt affects Gezira cotton although small patches of Rhizoctonia wilt (*Rhizoctonia solani*), characterized by a fibrous brown rot of tap root and hypocotyl, occasionally occur, especially in low-lying waterlogged places. Roots of wilting plants sometimes show the reddish discolored vascular cylinder often indicative of Fusarium wilt and isolates from them frequently yield *Fusarium* spp. including *F. vasinfectum* which causes a serious cotton wilt in India, Egypt, the U.S.A. and elsewhere. This specific Fusarium wilt as caused by *F. vasinfectum* does not appear to be a well-defined disease in the Sudan. Similarly no specific cotton wilt caused by *Macrophomina phaseoli* (*Rhizoctonia bataticola*), such as is reported from India and elsewhere, is known in the Sudan, although this fungus occasionally causes seedling blight and can rot roots previously damaged by insects. Neither Texas root rot (*Phymatotrichum omnivorum*) nor Verticillium wilt (*Verticillium albo–atrum*) is known in the Sudan although the latter occurs in Uganda – possibly soil temperatures in the northern Sudan are too high.

The relative freedom of Gezira cotton from serious root diseases may perhaps be associated with the following factors: (1) the very high alkalinity and heavy clay texture of Gezira soil and the prolonged high soil temperatures obtaining for several months between crops during which period the soil is very dry and is exposed to continuous intense sunlight almost every day. Survival of many fungi will be discouraged by such harsh conditions; (2) build up of root pathogens in the soil is reduced by the thorough uprooting and burning of all cotton plants at the end of the season and soil organic matter thereby remains at a low level; (3) crop rotation ensures an interval of 2–3 years between successive cotton sowings in the same field; (4) the very favorable conditions for growth as promoted by carefully regulated irrigation, widespread use of nitrogenous fertilizers, protection from pests and the cultivation of crop varieties well suited to the prevailing agricultural and climatic environment; all of which encourage vigorous plants likely to resist attack by soil fungi.

Non–fungal wilts affecting cotton in the Gezira are those which follow insect attack of the roots (e.g. by white ants) or heavy insect infestation of the leaves (e.g. whitefly) and the "physiological wilt" attributed by Boughey [2] to inability of the plant to obtain sufficient water under hot day conditions of high evaporation and low soil moisture. This midday wilting commonly occurs in hot weather and the plants usually recover later in the day, but in extreme cases permanent injury or death may result.

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[2] Boughey, A. S. Physiological cotton wilt in the Sudan Gezira. *Ann. Appl. Biol.* 31:12–18. 1944.

In some seasons with prolonged cold winter weather premature boll opening can cause serious crop losses in the Gezira. Soft reddish patches, which later become brown and dry, appear on parts of the boll walls exposed to sunlight in the early morning; parts shaded by the bracts are not affected. Young bolls scorched in this way split open and dry up prematurely. Field observations suggest that this condition usually follows prolonged cold weather and arises from exposure of the young bolls to strong early morning sunlight when soil temperatures are still low and the bolls thereby are unable to obtain sufficient water.

Numerous wild and cultivated plants are attacked by powdery mildews (Erysiphaceae) in the Gezira. Thus okra, a close relative of cotton, is often severely damaged by *Leveillula taurica*. This fungus which has been reported on cotton elsewhere probably consists of numerous specialized races and the evolution of a race virulent to cotton may be expected and might become very destructive in the intensively cultivated cotton fields of the Gezira. A powdery mildew has been noted on native grown cotton south of the Gezira and a tiny patch of what appeared to be the conidial stage of *L. taurica* was recently observed on a Sakel plant in a greenhouse at the Gezira Research Farm.

American Cotton (*Gossypium hirsutum*)

Blackarm is the major disease of rain-grown American type cotton in the central and southern Sudan but severe outbreaks are mostly avoided by cultivation of resistant cottons. Nevertheless, boll attack by this disease causes an unknown yet probably serious amount of lint staining with consequent deterioration of quality. Some varieties with high leaf and stem resistance appear to possess little boll resistance. The use of poisonous mercurial seed dressing is inadvisable in these areas but cuprous oxide dressing, although less effective than mercurials, would probably reduce seed-borne infection at a trifling cost per acre; their use is being investigated. Leaf curl is rarely seen on rain grown American cotton in the Sudan. Areolate mildew (*Ramularia areola*) is widespread in wetter areas and, to a lesser extent, leaf spotting caused by *Cercospora gossypina*, but neither is of economic importance. Lint damage by stainer bugs (*Dysdercus* spp.) is a major problem; it is not known whether these insects carry *Nematospora gossypii* and *N. coryli*, the stainer–borne fungi causing lint staining of cotton elsewhere in Africa.

Other Fiber Crops

Small experimental areas of jute (*Corchorus olitorius* and *C. capsularis*, also widely grown as the native vegetable "Jew's mallow") and Deccan hemp or kenaf fiber (*Hibiscus cannabinus*) are grown. The latter is susceptible to the cotton leaf curl virus which might become destructive under conditions of intensive cultivation. Jute suffers minor damage from two powdery mildews (*Leveillula taurica* and *Sphaerotheca fuliginea*), widespread leaf spotting (*Cercospora* sp.), an unidentified bacterial blight and leaf mosaic and distortion suspected to be of virus origin.

Sesame (*Sesamum indicum*)

This crop is the main source of vegetable oil within the Sudan and annual cultivation probably exceeds half a million acres, mainly rain grown in the central and southern Sudan. It is commonly attacked by a bacterial blight ("blood disease") similar in symptoms to that caused by *Pseudomonas sesami* in Japan, India and elsewhere. This disease can cause serious losses and would probably become very destructive in intensive cultivation as opposed to the relatively small, scattered patches of sesame grown at present. Powdery mildew (*Sphaerotheca fuliginea*) occurs on sesame in most areas and early attacks may cause considerable damage; that caused by *Leveillula taurica* occurs only in the northern Sudan and is of little consequence on this crop. Leaf spot (*Cercospora sesami*) is widespread in areas where annual rainfall exceeds 15–20 inches but rarely causes serious damage since it tends to be restricted to the older leaves. In the Nuba Mountains of the central Sudan sesame is sometimes severely attacked by a suspected virus disease; the leaves become narrowed and reduced, of dark green colour and thickened leathery texture with thickened sunk-

en veins. They tend to bunch at the top of the plant and flowers remain green and sterile. Somewhat similar symptoms have been reported on sesame in Uganda. Resistant strains of sesame have been selected but no real investigation has been carried out. Possibly the virus is seed transmitted since the disease appeared when sesame seed from the Nuba Mountains was sown recently in the Gezira.

Groundnut (*Arachis hypogaea*)

Small areas probably totaling about 100,000 acres are grown in the Sudan, mostly under rain on lightish soils in the center and south. Rosette disease (groundnut rosette virus) occasionally causes appreciable losses in the extreme south, which appears to be the only area in the country where the disease occurs. Early sowing is reported to minimize attack and it is possible, although not investigated, that some local groundnut varieties show resistance. Leaf spotting diseases caused by *Colletotrichum capsici*, *Phyllosticta* sp., *Cercospora personata* and *C. arachidicola* commonly occur in wet areas but only the latter two are of importance. Both species are extremely prevalent where annual rainfall exceeds 20–25 inches. Their economic significance is difficult to assess but early attacks can certainly cause extensive leaf shedding and loss of yield. Irrigated groundnuts in the Gezira often show various leaf spots and blotches of unknown origin. Seedling diseases, including crown rot attributed to *Aspergillus niger*, frequently occur. Seed treatment with organo-mercurial or thiram dressing considerably improves stands even with sound, undamaged sowing seed and becomes essential if satisfactory stands and yields are to be obtained from seed which has been slightly damaged (e.g. by mechanical decortication or machine sowing). With such seed heavy seed bed losses usually occur if it is not treated before sowing.

Other Oil Seeds

Minor or experimental oil crops include castor (*Ricinus communis*), sunflower (*Helianthus annuus*), safflower (*Carthamus tinctorius*) and oil palm (*Elaeis guineensis*). Castor in the Gezira and southwards is frequently and sometimes severely attacked by bacterial blight (probably *Xanthomonas ricinicola*), a disease of great potential destructiveness should cultivation be intensified. Mildew (*Leveillula taurica*) is a minor disease of castor in the northern Sudan while leaf spot diseases (*Alternaria ricini* and *Cercospora ricinella*) are common in wetter areas, *C. ricinella* being very widespread. Rust (*Melampsorella ricini*) and sooty mould (*Schiffnerula ricini*) occur in the extreme south. Diseases of sunflower include rust (*Puccinia helianthi*), which is sometimes quite severe in the central and southern Sudan, and minor leaf spotting (*Cercospora bidentis*) and powdery mildew (*Oidium* sp.). Safflower is sometimes affected by rust (*Puccinia carthami*) in the extreme north of the country where rain rarely falls; it is thought that heavy early morning winter dews provide sufficient moisture for spore germination and subsequent host invasion. Curiously enough this rust has not been found elsewhere in the Sudan. Oil palms are grown on a small scale in the south and commonly show mild leaf spotting caused by *Cercospora elaeidis*.

Coffee (*Coffea robusta, C. arabica*)

Coffee rust caused by *Hemileia vastatrix* is an extremely destructive disease and in some countries has rendered coffee cultivation uneconomic. In the southern Sudan it is widespread, especially on *C. arabica*, and undoubtedly causes appreciable crop loss. It is likely to become a major problem should intensive coffee cultivation be undertaken. Brown eye leaf spot (*Cercospora coffeicola*) is very prevalent in wetter areas and sometimes causes considerable leaf damage. "Red rust" caused by the parasitic alga, *Cephaleuros mycoidea*, occurs occasionally on coffee.

Tobacco (*Nicotiana tabacum*)

This crop, like coffee, is grown on a relatively small scale but has considerable potential importance. Leaf curl disease, probably caused by the tobacco leaf curl virus

as elsewhere in Africa and Asia, is fairly frequently encountered and could become destructive were cultivation intensified. Frog-eye leaf spot (*Cercospora nicotianae*) is very prevalent in areas where annual rainfall exceeds 15–20 inches and is often responsible for marked lowering of leaf quality; it is a potentially serious factor in future expansion of tobacco cultivation in the wetter regions of the Sudan.

A CORRECTION

In "Diseases of economic crops in the Sudan I. Cereals." by S. A. J. Tarr, published in this Bulletin 2: 75–77, 1954, under "Pearl Millet" on page 76 the causal fungus of downy mildew should read *Sclerospora graminicola* instead of *Sclerospora sorghi*.

Some Important Diseases of Conifers in Italy

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THE following notes record the noteworthy incidence of some diseases affecting coniferous trees in northern Italy. The recent discovery of the needle cast disease on Douglas fir is of special interest, being the first record of this disease not only in Italy but probably also in the Mediterranean region.

Needle Cast of Douglas Fir

In 1952 in an experimental plot of Douglas fir (*Pseudotsuga taxifolia*) near Tolmezzo, Udine province, a number of trees about 30 years old died and others showed severe defoliation. Upon examining the affected trees, the causal agent of this disorder was found to be *Adelopus gaümanni* Rhode (= *Phaeocryptopus gaümanni* (Rhode) Petr.) which had never been previously found in Italy. Since then the disease has progressed and there is indication that the remaining trees in the experimental plot will eventually all succumb to the attack.

Despite an intensive survey in other northern localities where Douglas fir is grown the disease has not yet been detected elsewhere. It is thought that the incidence of *A. gaümanni* near Tolmezzo probably has been due to the particularly damp and cold climate of that locality.

Branch Rust of Pine

Till 1950 there apparently had been no record in Italy of *Melampsora pinitorqua* Rostr., the cause of the branch rust of pine, despite the fact that it has been fairly widespread along the seaboard of Tuscany. The disease has also been found this year in the interior of Arezzo province, and on the Riviera near San Remo.

The rust, known to attack *Pinus sylvestris*, *P. montana*, *P. strobus* and *P. pinaster*, has been found in Italy also on *P. pinea* in addition to *P. pinaster* and *P. sylvestris*. It is prevalent on seedlings and young plants one to two years old. In the State Forest at Feniglia, Grosseto province, the rust three years ago destroyed nearly all the nurseries of *P. pinea*. Since the rust alternates between pines and poplars, drastic measures have been taken to eradicate all white poplars (*Populus alba*) and European aspens (*P. tremula*), found in the forest. This practice has given very satisfactory results as the number of pine seedlings affected by the rust has been quite small this year despite the exceptionally rainy spring.

Investigations on the biology of *Melampsora pinitorqua* have shown that the rust can overwinter in the infected twigs of poplar, thus perpetuating the parasite even in the absence of the alternate hosts, i.e., species of *Pinus*. To ensure effective control of the disease, the eradication of poplars therefore must be thorough and not leave any viable stumps in the ground, because the sprouts arising from stumps will carry and spread the infection.

Fully grown pines are seldom attacked by the rust and even when infection takes place there is no severe damage as the usual effect consists of only the characteristic bending of infected twigs. Damage however can be serious to young trees. Once the apical growth becomes infected and killed, the tree is not worth keeping, because the development of secondary shoots will make it unfit for timber.

Needle Rust on Spruce

Needle rust caused by *Chrysomyxa rhododendri* de Bary has been particularly severe on spruce (*Picea abies*) during the last two years owing to the exceptional rainy summer. The first symptoms appeared on

spruce about the end of July when pycnia of the fungus became evident on needles. The alternate hosts found in Italy are *Rhododendron ferrugineum* and *R. hirsutum*, the leaves of which are usually heavily covered by the rust. Uredosori appeared about the middle of August and were very distinct on the lower side of the leaves of *R. ferrugineum*, whereas on *R. hirsutum* the sori were quite small.

The first spruce trees showing infected needles are those located close to rhododendron shrubs; then gradually the infection spreads massively within well delimited areas in the forest. While within these areas the rust occurs in all shoots of every spruce tree, infected trees are scarce and the number of needles affected is small outside the areas. The way by which the infection reaches the more peripheral sites of the infected area suggests that pycnoconidia may play an important role in the spread of infection.

Wherever *Rhododendron* is present only in small groups widely scattered in the forest, its eradication offers a promising possibility of controlling this rust disease.

Plant Disease Situation in the United States

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Nematodes Associated with Mints in Oregon

ACCOUNTS of nematodes associated with plants of the genus *Mentha* are few. *Mentha piperita* and *M. arvensis* var. *piperascens* have been listed as hosts of *Meloidogyne. Aphelenchoides ritzema–bosi* has been reported on *M. piperita* and *A. olesistus* on *M. spicata. Ditylenchus destructor* was found on roots of *M. arvensis* in Michigan and Indiana. *Meloidogyne hapla* and *Paratylenchus* spp. were recorded in association with *M. piperita.*

During 1952 and 1953 several nematodes were found to cause or associate closely with diseases in mints in Western Oregon.

A root knot nematode, *Meloidogyne hapla*, was first noted on Scotch spearmint (*Mentha cardiaca*) which had been transplanted from the field to greenhouse pots. Subsequent examination of the field planting revealed that the Scotch spearmint was infected with root knot nematodes while in adjacent fields no infection was apparent on peppermint.

In greenhouse inoculation tests, species and varieties of mints were exposed to infection from soil infested with the root knot nematode. After 68 days larvae and gravid females of the nematode were found in all mints tested, whereas control plants remained free from infection. The plants tested included common spearmint (*Mentha spicata*), Scotch spearmint (*M. cardiaca*), commercial peppermint (*M. piperita* var. *mitcham*), wild peppermint (*M. piperita* var. *americana*), field mint (*M. arvensis* var. *canadensis*), pennyroyal (*M. pulegium*), crispleaf mint (*M. crispa*) and 15 hybrids of *M. piperita* × *M. crispa.*

Paratylenchus macrophallus was observed in all stages of development within living stems and underground buds of commercial peppermint from most fields examined in Western Oregon. Fungi causing a root and rhizome rot are closely associated with large numbers of *Paratylenchus* in the mint tissue and surrounding soil. In one field, soil around stunted and chlorotic plants was found to contain 8,000 individuals of *Paratylenchus* per quart (= 1.1012 l.) and the nematodes were also observed in the root tissue.

Aphelenchoides parietinus and other species of *Aphelenchoides* were found associated with the meristematic cells of underground mint shoots. As many as 400 specimens of *Aphelenchoides* were counted in a single shoot tip. The nematodes occupy the spaces between the apical meristem and leaf primordia, and under the young leaves enveloping the apical meristem. Several days after shoots have emerged from the soil, the nematodes are no longer found in the tips.

During 1953 a species of *Longidorus* was found to be associated with extensive stunting and dying of peppermint throughout many of the older mint growing areas of Western Oregon. In experimental tests *Longidorous* caused severe stunting and a root die–back condition in peppermint.

A Stylet Nematode of Importance in the Southwest

Within the past few years considerable attention has been given to nematodes that puncture and feed on roots from the outside. These ectoparasitic nematodes constitute pests of major importance in the southeastern United States. Among them are the stylet nematodes. One species, *Tylenchorhynchus claytoni*, was at first considered a rare parasite of tobacco, but is now known to be rather widely distributed in the eastern States where it is a root pest of many species of plants.

In the Southwest examination of numerous soil samples has shown that *Tylenchorhynchus dubius* is the most common species of stylet nematodes associated with the roots of both native and cultivated plants.

Results of investigations indicate that *T. dubius* causes debilitation of host plants, the top and root systems of which are both reduced in size. The adult nematode was not observed within the root tissues, but a few very young larvae were found in secondary roots of cotton plants which had scarcely pushed through the epidermis. *T. claytoni*, however, has been found in both adult and larval stages distributed through the root parenchyma of tobacco, indicating a vagrant mode of life. This raises the question as to whether members of this genus may not be capable of feeding both inside and outside roots.

Another question concerns the possibility that nematodes such as *T. dubius* can be the cause of crop debilitation sometimes attributed to other factors. For example, very significant increases in crop yields have been achieved by soil fumigation for control of root knot nematodes (*Meloidogyne* spp.), which are endoparasitic and sedentary in habit. On the other hand, increased crop yields have also been reported after fumigation of land judged to be free of root knot nematodes. An increase of available nitrogen was thought to be responsible for this growth stimulation. It has been suggested that nitrogen transformation in the soil is affected by fumigation, whereby the change of nitrogen from the ammonia form to the nitrate form is delayed for several weeks, extending into the growing season in the field; thus nitrogen ordinarily lost as nitrate by leaching during the early part of the season is conserved. However, results of experiments with the stylet nematodes indicate that the control of these and possibly other ectoparasitic nematodes by soil fumigation would account for much of these increases in crop yields.

Root Parasitic Nematodes in Golf Courses in Rhode Island

During the past two years a number of samples of fine turf submitted for disease diagnoses from various parts of Rhode Island were found to contain large populations of plant parasitic nematodes associated with roots and soil. To determine the geographic distribution of these parasites, a survey of 41 putting greens from 17 different golf courses situated throughout the State was undertaken.

Root and soil samples were selected from sections of greens which contained definite symptoms of chlorosis or dieback of grass blades. Turf exhibiting chlorotic patches occasionally would contain bare areas where individual plants had died out completely.

Close examination of individual grass plants in the diseased area showed dieback, or dead blades interspersed with healthy green blades of grass. This condition is not known to be associated with any of the fungi attacking grasses in the New England area.

The most widely distributed parasitic nematodes found in this survey were the stunt or stylet nematodes, *Tylenchorhynchus* spp., the predominant member being *T. claytoni*. In one instance where grass had grown poorly for several years, an extremely large population of *T. claytoni* was found in the soil. *T. dubius* also was found in several cases in combination with *T. claytoni* or with other nematodes. In view of the pathogenic nature of this genus it is very likely that *Tylenchorhynchus* plays a major role in devitalizing bentgrass (*Agrostis*) turf in Rhode Island.

The spiral nematode, *Rotylenchus [erythrinae*, was less widespread than the stunt nematodes, but nevertheless was found in more than half of the greens investigated. In samples containing it the spiral nematode was usually present in larger numbers than other coexisting species.

A nominal number of samples contained *Heterodera* sp., *Pratylenchus pratensis*, and *Tylenchus* sp. The *Heterodera* sp. observed appeared close to *H. major* in regard to cyst shape, cyst wall markings, and larval characteristics. The meadow nematode (*P. pratensis*) occurred in 25 percent of the greens examined, but was relatively few in number. These nematodes are endoparasitic cortical feeders, and it is possible that many of them existed within the grass roots and escaped detection. *Tylenchus* spp. were frequently encountered in soil but seldom in

large numbers. Apparently they contribute to the overall damage done to grass roots, but are less destructive than some species of other genera.

The discovery of *Psilenchus hilarulus* in eight greens indicates that this species may be more of a problem to successful culture than previously thought. Other parasites found include the lance nematode (*Hoplolaimus coronatus*), *Criconemoides* sp., *Paratylenchus* sp., and *Ditylenchus* sp. Evidence suggests that they may contribute to grass root damage but rarely are entirely responsible for it.

A number of suspected plant parasites were found, including *Xiphinema americanum*, *Longidorus sylphus*, and species of *Pungentus*, *Dorylaimus*, *Tylencholaimus*, *Diptherophora*, *Dorylaimellus*, and *Enchodelus*. Among them, *Dorylaimus* spp. are a large group in which plant parasites are known to occur. Similarly suspected of being parasitic are the needle nematodes, *Xiphinema americanum*, and its close relative, *Longidorus sylphus*. The remaining genera are forms that possess the necessary structures to be plant–parasitic and have been found associated with numerous cases of plant decline. Proof of their pathogenicity, however, is lacking.

A number of other nematodes found in association with root and soil samples from the putting greens are considered to be non–parasitic. Possible exceptions of this group may be *Eucephalobus* spp. and *Panagrolaimus* sp. which were found in one sample to be associated with the diseased grass shoots.

The survey demonstrated the presence of a variety of plant–parasitic nematodes in fine turf greens where unexplained diseases existed. The assumption that plant nematodes are of only slight significance in places subject to colder climates is contradicted by the evidence presented here.

Outbreaks and New Records

Libya (Cyrenaica)

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The present notes on the incidence of the more important pests and diseases in Cyrenaica, Libya, are mainly based upon a survey trip made by the writer during the latter part of May 1954, supplemented by observations made in the same region during September 1952.

The geographic name Bengasi used here covers the city and its surroundings and also the cultivated areas between Bengasi and Tocra. The term Plateaux refers to the highlands between the cities of Barca and Derna, particularly the Madi Kuf, Messa Beida, Balandj, Cyrene, Saf Saaf and Gubba, all of which were covered by the survey. In the Derna region are included the coastal crop areas at Latrun and Ras el Halil.

It is interesting to note that the pest and disease problems in Cyrenaica are often quite different from those in Tripolitania. For instance, the Psyllid, *Euphyllura olivina*, on olive fruits and olive knot (*Pseudomonas savastanoi*) are serious pests in Tripolitania but are practically unknown in Cyrenaica. Citrus scales are also far more dangerous in Tripolitania than in Cyrenaica. On the other hand, twig borer (*Anarsia lineatella*) and leaf curl disease (*Taphrina* spp.) on stone fruits, though comparatively harmless in Tripolitania, are prevalent in Cyrenaica.

Stone Fruits

Twig borer (*Anarsia lineatella*) was observed causing considerable damage on almond trees and, to a lesser extent, on peach trees, mainly in orchards at Barca and on the Plateaux. The young caterpillar bores into the tender new shoot from the end, causing the withering and wilting of the twig. The resultant damage is usually not severe except in young nursery trees. On the other hand, heavy losses of fruit often occur when the worm penetrates the fruit near the peduncle, mines into the pulp and devours the seed.

Mediterranean fruit fly (*Ceratitis capitata*) causes more damage along the coastal belt than in the drier regions in the interior. Its development is favored by hot and fairly humid weather. Attacks by this fly on late peaches and apricots have been reported from Bengasi, Barca and Derna, but the late peaches I observed in September 1952 at Beida were completely free from infestation.

Among diseases observed, leaf curl (*Taphrina deformans*) and shot-hole (*Clasterosporium carpophilum*) are prevalent in the Barca area and on the Plateaux. The attacks of leaf curl in 1954 were exceptionally heavy on almonds and peaches. Shot-hole disease was common on all species of stone fruits, causing twig blight on apricots and plums.

Apple and Pear

Codling moth (*Carpocapsa pomonella*) was observed in September 1952 to cause damage on apples at Barca, but no outbreaks were seen in May 1954. It is likely that the insect can be damaging under certain conditions, especially to late varieties.

Mediterranean fruit fly frequently attacks pears and is particularly injurious to late varieties. The losses of the fruit due to this insect are likely to be serious in the Bengasi and Derna areas. Apples, on the other hand, are rarely infested.

Both apple scab (*Venturia inaequalis*) and pear scab (*V. pirina*) are common in the spring and severe infections were ob-

served in particular on apple trees at Barca and on the Plateaux.

Citrus

Mediterranean fruit fly was found in orange and tangerine fruits received from Barca in January 1954. Severe attacks have been reported at Bengasi and Derna, mainly, on tangerines but also on oranges. However, oranges that had reached maturity but were still on the trees in an orchard at Barca visited in May 1954, showed no punctures of the fly.

Scale insects, such as *Chrysomphalus dictyospermi* and *Coccus hesperidum*, are in general not serious in Cyrenaica. Severe outbreaks of *Lepidosaphes citricola*, however, were observed on a few occasions in the Derna region.

Citrus trees, including oranges, tangerines and lemons, were found to show poor growth and die-back of twigs at Bengasi and Barca and, to a limited extent, at Derna. In addition to occasional disease infections, nutritional deficiencies evidently were the main causes.

Olives

Olive fly (*Dacus oleae*) causes severe damage in Cyrenaica as well as in Tripolitania. In 1952, olives of the large-fruit variety were observed to be already heavily attacked in September, while local varieties with small fruit suffered much less. In January 1954, samples of olive fruit collected at Bengasi, Barca–Zorda, and Messa were sent to the writer for examination and were found infested at the following percentages: 83, 99 and 55 for the local varieties for the three locations respectively, and 98, 70 and 93 for the introduced Italian variety.

Black scale (*Saissetia oleae*) is much more prevalent in Cyrenaica than in Tripolitania. During both trips in 1952 and 1954, heavy infestations were observed and the number of scales on the olive trees was enormous. Grubs are very susceptible to drought and high temperatures, which fact accounts for the scarcity of this insect in regions which are subject to Ghibli, the hot wind from the Sahara.

Other scale insects do not seem to cause any appreciable damage. It will be necessary, nevertheless, to watch for their development, in particular that of olive Pollinia scale (*Pollinia pollini*) which may become serious under favorable conditions.

Among the other insects of lesser importance, *Zonabris oleae* was observed to cause considerable losses on the Plateaux and, to a lesser extent, at Barca.

United States

Plant Pest Control Branch
Agricultural Research Service
United States Department of Agriculture

European Chafer Recorded in West Virginia

The European chafer (*Amphimallon majalis* Raz.), a destructive pest of turf, was collected in West Virginia for the first time in June 1954. Adults were taken in traps and in flight in Hampshire County. The insect, which is known elsewhere in the United States only in western New York and at Meriden, Connecticut, was apparently introduced into the West Virginia area through a shipment of infested nursery stock.

New Ground Pearl Records for North Carolina and California

A ground pearl (*Eumargarodes laingi* Jak.) was found in the State of North Carolina, for the first time, during July 1954. Specimens were collected from grasses in the City of Wilmington, N. C. This insect is known elsewhere in the United States only in the western part of the State of Florida where it has caused some damage on grasses. Another species (*Margarodes meridionalis* Morr.) was recently recorded as present in Imperial

County, State of California, on roots of grapes. Subsequent to its discovery the coccid was found in other areas of Imperial County, Calif., on roots of Bermuda grass (*Cynodon dactylon*) with which it is customarily associated. Apparently the association of *M. meridionalis* with grape roots is unusual.

A Dermestid New to Western Hemisphere

A dermestid (*Attagenus alfierii* Pic.) has been collected at several locations in the State of Arizona. This beetle has not been recorded previously as occurring in the United States or the Western Hemisphere. As far as can be determined, the species is of no economic importance.

Mexican Fruit Fly Found in California

The Mexican fruit fly (*Anastrepha ludens* Loew), which was reported earlier in 1954 from Tijuana, Baja California, Mexico, was collected 9 August at San Ysidro, San Diego County, California. A single female adult was trapped in a grapefruit tree about one mile north of the international border. This is a first record of occurrence of this serious fruit pest in the State of California. Previously planned control programs against the fly were placed in operation immediately.

PLANT QUARANTINE ANNOUNCEMENTS

Cuba

1. Resolutions No. 682, No. 313 and No. 743, dated 12 March 1953, 23 October 1953 and 30 March 1954 respectively, authorize the importation into Cuba of garlic from Egypt, Japan and Peru on condition that the shipments of garlic from these sources are covered by official phytosanitary certificates issued by the country of origin and duly legalized by the Cuban Consul. If not accompanied by the required phytosanitary certificates, the shipments will be fumigated upon arrival in Cuba.

In addition to the three countries mentioned above, Argentina, Spain, Italy, Mexico and Chile were authorized by Decree No. 2745 of 4 October 1940 to export garlic to Cuba.

2. Resolution No. 396 dated 3 December 1953 authorizes the importation from Japan into Cuba of lily bulbs and bulbs and rhizomes of other species of ornamental plants, excluding plants of the genus *Musa* whose importation is prohibited by Decree No. 2745 of 4 October 1940. Shipments must be packed in clean siliceous or coral sand and covered by official phytosanitary certificates issued by the agricultural authority of the country of origin, certifying that the plant materials are free from harmful pests and diseases and from earth.

In addition to Japan, Bermuda Islands were authorized by Decree No. 2745 of 1940 to export lily bulbs to Cuba under the same conditions.

3. Resolution No. 436, dated 17 December 1953, authorizes the importation into Cuba of apples and other fresh fruits for consumption proceeding from Canada. Shipments will be subject to inspection by the Plant Quarantine Service of the Ministry of Agriculture and, if found to be infested, will be refused entry.

The above-mentioned authorization does not extend to the fruits specifically prohibited by Decree 2745 of 4 October 1940.

France

An Order of 17 June 1954, relating to the importation and transit of chestnut wood, plants and fruit, and published in the *Journal Officiel*, Vol. 86, No. 155, 5–6 July 1954, revokes and replaces the Order of 11 December 1950 on the same subject.

The Order prohibits the importation and transit of chestnut wood and plants designated below, originating from any country.

1. Non-rooted cuttings and scions of chestnut.
2. Nursery stocks and other living plants of species of chestnut.
3. Raw tanning material of plant origin, i. e., wood and bark of chestnut.
4. Fuelwood of chestnut.
5. Rough roundwood of chestnut, even without bark.

6. Squared or planed timber of chestnut.
7. Sawn wood of chestnut.
8. Railway sleepers made of chestnut.
9. Chestnut wood for barrels.
10. Branches with foliage, rails, laths, and split vine props of chestnut.
11. Prepared stakes and pickets of chestnut.
12. Sawdust of chestnut.
13. Planed, grooved and tongued wood of chestnut.
14. Packing cases and light containers made entirely or partially of chestnut.
15. Barrels encircled with chestnut wood.

The importation of chestnut fruits from any country is subject to the delivery of a phytosanitary certificate. If the chestnut blight disease (*Endothia parasitica*) exists in the exporting country, the certificate should state that the products have been disinfected according to a method acceptable to the French Plant Protection Service.

Sweden

Royal Decree No. 381 of 4 June 1954, published in the *Svensk Författningssamling* on 18 June 1954, supplements Royal Decree No. 8 of 12 January 1951 concerning the prohibition of imports of living elm plants, elm bark and elm timber. The new Decree authorizes the Government Plant Protection Institute to grant exemptions, in special cases and on conditions prescribed by the Institute, from the prohibition stipulated in Article 1 of the 1951 Decree.

United States

1. Administrative instructions prescribing the method of treatment of mangoes from the West Indies, published as Foreign Quarantine Notice 319.56–2i in the *Federal Register* Vol. 19, No. 45, 6 March 1954, authorize the importation from the West Indies under permit of mangoes that are to be given an approved fumigation treatment. Heretofore such movement has been prohibited.

Mangoes offered for entry into the United States must be shipped direct from the country of origin to New York or any other North Atlantic port named in the permit. They must be cooled to a maximum temperature of 50°F. prior to unloading from the ship. The approved treatment consists of fumigation with ethylene dibromide at normal atmospheric pressure, in an approved fumigation chamber and in accordance with methods prescribed in the instructions.

2. Amendment of administrative instructions for cold treatments of imported vinifera grapes and certain other fruits, published as Foreign Quarantine Notice 319.56–2d in the *Federal Register* Vol. 19, No. 48, 11 March 1954, provides modified schedules of refrigeration temperatures and periods for vinifera grapes and other fresh fruits which are enterable under permit and are to be held under refrigeration.

According to the modified schedules, fruit to be cold treated because of the Mediterranean fruit fly or fruit flies of the genus *Anastrepha* should be refrigerated for one of the following periods at or below the respective temperature designated.

For Mediterranean fruit fly:

10 days – 32°F.
11 days – 33°F.
12 days – 34°F.
14 days – 35°F.
16 days – 36°F.

For *Anastrepha* fruit flies:

11 days – 32°F.
13 days – 33°F.
15 days – 34°F.
17 days – 35°F.

NEWS AND NOTES

Colorado Beetle and Potato Eelworm in Europe and the Mediterranean Region in 1953

Based upon information gathered from its member nations, the European Plant Protection Organisation has recently circulated mimeographed reports on the 1953 situation of Colorado beetle (*Leptinotarsa decemlineata*) and potato root eelworm (*Heterodera rostochiensis*) in Western Europe and the Mediterranean region. The general situation is as follows:

Colorado beetle. The areas infested by Colorado beetle in Western Europe have not changed appreciably during 1953, except for a slight advance southwards. In Portugal, the province of Algarve in the extreme south is now wholly infested, the infestation covering 1,500 hectares in 1953 in comparison with 220 hectares in 1952. In Spain extension occurred in the provinces of Malaga, Sevilla and Cadiz, but an infestation pocket which had become established in the Balearic Islands in 1952 is now apparently eradicated. In Italy, the beetle spread along both the Adriatic and Tyrrhennian coasts. In Yugoslavia the infestation in Slovenia became general, whereas parts of Croatia were newly invaded, the infested areas totalling 9,500 hectares in 1953 as against 4,600 hectares in 1952. Local extension occurred in Austria and Luxembourg. No cases of outbreaks have as yet been reported from the North African coast. In all other regions the infested areas remained practically unchanged, though it seems that this stability has not yet reached the German–Danish border. The number of infested districts in Schleswig–Holstein increased slightly, reaching again the 1951 level, and the finding of some colonies of larvae and a few isolated adults in southern Denmark is probably related to this extension. However, the beetle again failed to become established in any part of Scandinavia. The same holds true for the British Isles, where not a single beetle was found on potato crops or in association with imported potatoes, and the number found from other sources was considerably lower than in 1952.

As regards the intensity of infestation, only in Yugoslavia and central Portugal were attacks by the beetle more severe than in the previous year. In all other countries, apart from occasional local infestation of late potatoes, the general picture was one of rather mild attacks with an intensity less than that of 1952. This was due to several causes. First of all chemical control has as a rule become a normal routine, and its efficiency has increased with the gradual improvement of the position with regard to equipment. Secondly, climatic conditions had a definite influence. In some cases the beetle was held in check by low spring temperatures, and even frost followed by abnormally heavy rainfall; this was the case in Switzerland where only one complete generation was recorded. In many countries, however, frequent rains prevented timely application of pesticides and thus increased the numbers of beetles, as in Germany, Luxembourg and the Saar. But since the rains had also favored the development of potato blight, the potato haulms withered too quickly to provide adequate food for the increased beetle population and as a result many beetles soon died of starvation or migrated to healthy crops or to other hosts, such as eggplant. A still more serious aspect was that food shortage caused many beetles and probably also some full–grown larvae to go into the ground very early. This may well result in a considerable initial infestation in 1954.

Several countries studied the possibility of a relationship between the geological features of their potato–growing districts and the intensity of infestation. However, only in the Saar did such relationships seem apparent. Here light soils showed a higher infestation than heavy soils, and river valleys, e. g., Moselle, were more readily infested than hilly land. In Germany it was found that the infestation did not change with altitude, though in the mountains all stages were about a fortnight later than in the lowlands.

Potato root eelworm. During 1953 potato root eelworm was found for the first time in Algeria near the city of Algiers, and in Iceland at Reykjavik and other places along the west coast. Surveys have been carried out to ascertain the extent of infestation. Norway, Luxembourg, Italy, Portugal, Tunisia and Malta remained free from this pest. In countries where the nematode has become established, there was little change in the general situation in comparison with that of 1952, though local extension or regression of infected areas was reported in the following cases.

In Sweden infestation was found in 18 more districts situated near Stockholm and in the southern provinces, but all in areas where the nematode had been found earlier. In the Netherlands no new foci of infestation were ascertained, but in a number of cases new outbreaks were found in the neighborhood of the known infested

plots. The German Federal Republic continued the systematic survey which showed only 0.1 percent of the 240,000 soil samples examined from 1951 to 1953 containing nematodes. The infestation occurred chiefly in gardens and small fields in which potatoes had been grown continuously during the period of food shortage after the war. The cultivation of potatoes has been discontinued and the risk of further extension of infestation has thus decreased. In France an area in the Department of Ille-et-Vilaine in Brittany was found infested, probably with St. Malo as a center. The position was unchanged near Paris, but in Dunkirk in the north there was a regression in the infested area due to the fact that in this area potato growing has been almost entirely discontinued. The infested coastal strip in Belgium was also regressing. In Austria, the infestation further east in Salzburg appeared to have been hindered.

In the British Isles, there was no material change in incidence during 1953, except that a number of new outbreaks was found in the infested areas in Scotland.

WMO Working Group on Weather and Phytopathological Problems

In accordance with a resolution adopted at its First Session, Paris, November 1953, the Commission for Agricultural Meteorology of the World Meteorological Organization has recently set up a Working Group on Weather and Plant Pathological Problems. The Working Group consists of four members, with P.M. Austin Bourke of Ireland as Chairman. Its main functions are to survey the existing methods of forecasting outbreaks of potato blight, and to advise on the extension of the techniques in use to problems of other diseases or pests. A report will be submitted to the Commission for Agricultural Meteorology not later than 1 January 1955.

Commonwealth Entomological and Mycological Conferences

The Sixth Entomological Conference and the Fifth Mycological Conference were held successively in London in July 1954. The objects of these Conferences are to discuss recent achievements and important problems in the fields of entomology and plant pathology and to consider the work of the Commonwealth Institute of Entomology and the Commonwealth Mycological Institute. The Entomological Conference was attended by 51 official delegates and the Mycological Conference by 36, representing the United Kingdom and a number of the overseas governments of the British Commonwealth. In addition, many entomologists and plant pathologists from various institutions also participated.

At the Entomological Conference, technical papers and discussions were presented on the following subjects:

1. Recent developments in the use of insecticides on field crops.
2. Recent developments in the use of insecticides from aircraft.
3. Effect of chemicals on the balance of animal populations.
4. The development of resistance to insecticides.
5. Supply and training of taxonomists.
6. Estimation of real losses from insect pests.
7. Biological control of insect pests.
8. Biological control of weeds.
9. Pests of tropical cereal crops.
10. Development in work on pests of stored products.
11. Problems of forestry entomology.
12. Developments in termite research.
13. Developments in locust and grasshopper research and control.
14. Recent developments in tsetse research and control.

At the Mycological Conference, the following topics were covered:

1. Plant disease legislation against seed-borne diseases.
2. Losses caused by plant diseases in the Commonwealth.
3. Cereal rusts and their control.
4. Eradication of established plant diseases.
5. Antibiotics in plant disease control.
6. Low volume spraying.
7. Control of black pod of cacao.
8. Tobacco diseases in Southern Rhodesia.
9. Oil palm diseases in Nigeria.
10. Blister blight of tea.
11. Virus diseases.

Full details will be given in the Proceedings of the Conferences, which will be issued shortly.

Roma - Tip. del Senato del dott. Giovanni Bardi

NEWS OF FAO PUBLICATIONS

Zebu Cattle

As was expected, the Spanish edition of this unique collection of information on the subject (*Zebu Cattle of India and Pakistan*, $3.00, 15s.) is in great demand in all parts of Latin America. First news of its success came from Argentina, and fresh supplies have been sent to Mexico.

The cattle breeders' press of the Southern States of U.S.A. is enthusiastic about this book. It says that no other publication has collected so much useful information about these important breeds, and the illustrations were liked.

Monograph on Legumes Reviewed

Respectful reviews in *Nature* (London) and the *Journal of Tropical Agriculture*, of the FAO monograph *Legumes in Agriculture* ($3.00, 15s.) have increased the already lively demand for this monograph in all parts of the world. FAO is commended for collecting information on an important subject.

Continuing Demand for FAO Studies

Reports from London say that the demand for *Improving the World's Grasslands* (published for FAO by Leonard Hill Ltd., at 10s. 6d.) has been maintained. The second printing of *Soil Conservation: an International Study* (FAO, $2.00, 10s.) is widely used as a textbook in agricultural colleges.

Multilingual Vocabulary

Swedish, Dutch, Italian, Portuguese, Spanish, German, French, and English are the eight languages used in the *Multilingual Vocabulary of Soil Science* ($4.00, 20s.) just published by FAO. It has been edited by G.V. Jacks in collaboration with soil scientists in all parts of the world. The project has been on the FAO program since 1949 and even in the very short time since the advance copies of the book have been in circulation, suggestions for improvements have come for consideration in the editing of a new edition. The vocabulary has already been in use at a meeting of soil scientists in Africa to which a small supply was taken by an FAO expert.

Mechanization of Agriculture

The *Agricultural Machinery Journal* (August 1954) devotes a long review to FAO Development Paper No. 44, *The Successful Introduction of Farm Mechanization* ($0.50, 2s. 6d.). It points out that the booklet has drawn on practical field experience gained in many underdeveloped countries by FAO experts on missions for the UN Expanded Technical Assistance Program, and it draws attention to the appendix which gives a suggested four-week syllabus for an excellent farm machinery course. Since the publication of this review, and a short notice in *Tropical Agriculture* drawing attention to the practical approach of the book, our London agent has ordered fresh supplies.

Books on Agriculture

FAO Agricultural Studies now include 27 titles, and the newer series of Agricultural Development Papers has 44 titles. Bulletins about those two important series are ready and will be sent on request.

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1945-1954

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